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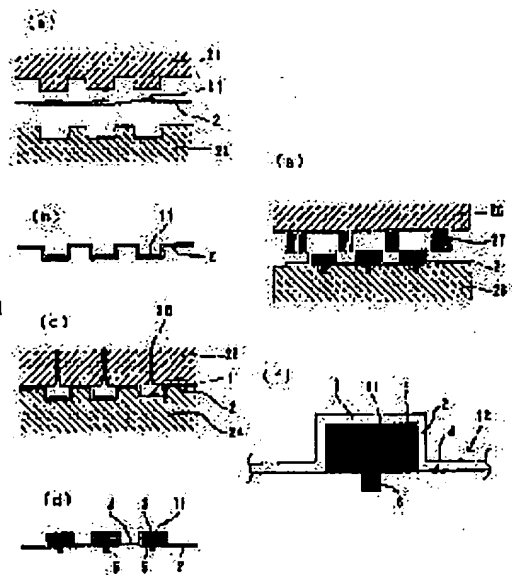
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## (54) RESIN FILM KEY TOP BOARD AND ITS MANUFACTURING METHOD

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a resin film key top board with excellent responsiveness to a product shape by making it freely bendable in any or both of X, Y directions or in many steps without applying notches to it.

**SOLUTION:** In this resin film key top board having a plurality of protruded push button sections, part or all of a base section 4 is applied with a plastic deformation process to be freely curved or bent. Individual depression sections 6 are made different in height from the base section 4 as desired. A resin film 2 is drawn to form a plurality of protruded push button sections 3, a fluid resin or a fluid rubber material is filled in the protruded push button sections 3, then the plastic deformation process is applied to part or all of the base section 4 after the fluid resin or fluid rubber material is hardened or solidified. The plastic deformation process may be applied before drawing. The plastic deformation process is applied by patting or pressing with a frog-like jig 26 or by laser beam radiation.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The keytop plate made from a resin film with which a part or all of the base section is characterized by a free curve and physical-plastic-deformation-processing or physical thinning processing in order to close, if in the keytop plate made from a resin film which has two or more push button sections.

[Claim 2] The height from the film base section of each press section which projects from the inferior surface of tongue of each keytop is the keytop plate made from a resin film indicated by claim 1 characterized by having changed the height and having closed so that the location under [ each ] the press section may be mostly located on the same flat surface, where a keytop plate is curved or bent.

[Claim 3] The manufacture approach of the keytop plate made from a resin film which carry out spinning of the resin film , and be characterize by perform physical plastic deformation processing or physical thinning processing to a part or all of the base section after form two or more convex push button sections , be fill up with fluid resin or a fluid rubber ingredient into this convex push button section and harden or solidify this .

[Claim 4] The manufacture approach of the keytop plate made from a resin film characterized by having carried out spinning of this resin film, having formed two or more convex push button sections, having been filled up with fluid resin or fluid rubber into this convex push button section, and hardening or solidifying this after performing physical plastic deformation processing or physical thinning processing to the predetermined part of a resin film.

[Claim 5] It is the manufacture approach of the keytop plate made from a resin film indicated by claim 3 or claim 4 characterized by performing the physical plastic deformation processing or physical thinning processing performed to a part or all of the base section by \*\*\*\* by the Mt. Tsurugi-like fixture, and forcing.

[Claim 6] the manufacture approach of the keytop plate made from a resin film indicated by any of claim 3 characterize by the rod tip of this Mt. Tsurugi-like fixture be heat by more than the glass transition point of this resin film, and the temperature below softening temperature - claim 5 they be when \*\*\*\* by the Mt. Tsurugi-like fixture and forcing actuation perform the physical plastic deformation processing or physical thinning processing perform to a part or all of the base section.

[Claim 7] The manufacture approach of the keytop plate made from a resin film indicated by claim 3 or claim 4 characterized by performing the physical plastic deformation processing or physical thinning processing performed to a part or all of the base section by the exposure of laser light.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the keytop plate which is a member for Personal Digital Assistants, such as various input units, especially a cellular phone, and its manufacture approach.

[0002]

[Description of the Prior Art] In recent years, if the inclination of thin-shape-izing and a miniaturization not only became strong, but a portable electronic device is especially in a cellular phone, the request to what has a curved surface from what has the superficial array of a key has become strong from the field of design nature and functionality. Drawing 5 is the perspective view of the keypad made of rubber in the conventional technique, and a is [ the sheet-like rubber base section and c of a keypad and b ] the convex push button sections. If it is a keypad made of rubber as shown in drawing 5, from the material property of rubber Although it is desirable also from the field of an assembly also from the field of a design free in every direction since it is turnable, a curve and, it sets from it being a product made of rubber especially at the stage of heat and high humidity. When a keytop top panel was press, it was sticky, there was fault that a feeling of finger touch was bad, and in processing of a rubber ingredient, even if it could make thickness of the base section to some extent thin, since the rubber ingredient itself was lacking in endurance, there was a limitation in thin-shape-izing and lightweight-ization as a result.

[0003] Moreover, the attempt using the keytop plate made from a resin film as shown in drawing 6 is also made. Drawing 6 is the sectional view in every direction and keytop plate top view which made it curve in the direction of Y like [ at the time of inclusion of the keytop plate in the conventional technique (JP,7-302526,A) ], and the drawing of longitudinal section where drawing 6 (a) meets the top view, and drawing 6 (b) meets the F-F line in drawing 6 (a), and drawing 6 (c) are the cross-sectional view which meets the E-E line in drawing 6 (a). It is here and, for a resin film and c, the convex push button section and d are [ a' / a keytop plate and b' / the keytop section and f of the base section (film base) and e ] the press sections.

[0004] This keytop plate made from resin film a' carries out spinning of the resin film by die forming, considers as resin film b', fills up with fluid resin or a fluid rubber ingredient the predetermined section d of which a feeling of hard finger touch is required, for example, the keytop section, and hardens or comes to solidify it. However, on constraint of the quality-of-the-material property of a resin film, although keytop plate a' made from this resin film had solved the fault of the keypad a made of rubber, as resin film b' itself does not incurvate either the direction of X of a product, or the direction of Y, that curve moreover cannot curve free like a rubber ingredient, either and an arc was greatly drawn once on an one direction, it was that a curve is only possible. therefore -- in order to consider as a complicated configuration -- the base section d of keytop plate a' -- cutting deeply (not shown) -- it had to put in and fear of mixing, such as moisture and a foreign matter, was between the keytop plate and the electrode substrate (not shown).

[0005] Moreover, the height of the keytop from the base section d (in the part in which the convex push button section of a resin film is not formed, and the following, it is also called the film base) is changed

in order to show the keytop top panel located in a line in the direction which does not incurvate resin film b' itself so that a sequential curve may be carried out along with Key Caps. When it does in this way, in the highest key, the keytop section d must be filled up with many restoration resin ingredients from the film base. since the case (not shown) itself cannot incurvate resin film b' further again -- thick - not becoming -- it did not obtain but there was a limitation in lightweight-ization of equipment and a member. Although thin-shape-izing of only a case is possible once, since resin film b' itself is not curving, an opening is generated between the film base and a case bottom plate, and it tends to become causes, such as foreign matter mixing.

[0006]

[Problem(s) to be Solved by the Invention] therefore, the technical problem which this invention tends to solve -- the above-mentioned trouble -- it is going to cancel -- even if it is a thing and does not put in slitting in the keytop plate made from a resin film -- any direction of the direction of X, and the direction of Y -- moreover, both directions -- moreover, it supposes that it is turnable free in many steps, and is in the point of having excelled also to the correspondence nature to a product configuration.

[0007]

[Means for Solving the Problem] In order that this invention may solve the above-mentioned technical problem, in the keytop plate made from a resin film which has two or more convex push button sections, a part or all of the base section is characterized by a free curve and physical-plastic-deformation-processing or physical thinning processing in all the directions in order to close, if . The height from the film base section of each press section which projects from the inferior surface of tongue of each keytop changed the height, and is closed so that the location under [ each ] the press section may be mostly located on the same flat surface, where this keytop plate is curved or bent. After the keytop plate made from a resin film of this invention carries out spinning of the resin film, forms two or more convex push button sections, is filled up with fluid resin or a fluid rubber ingredient into this convex push button section and hardens or solidifies this, it performs and manufactures physical plastic deformation processing or physical thinning processing to a part or all of the base section. Physical plastic deformation processing or physical thinning processing may be performed before spinning. Physical plastic deformation processing or physical thinning processing may be performed by \*\*\*\* by the Mt. Tsurugi-like fixture, and forcing by laser light exposure again. It is desirable for the rod tip of a Mt. Tsurugi-like fixture to be heated by more than the glass transition point of a resin film and the temperature below softening temperature.

[0008]

[Embodiment of the Invention] This invention is based on the knowledge that X-Y both directions can be incurvated now free, in the keytop plate made from a resin film for which a curve and bending are not usually free by making a wave strike with decreasing thickness by the physical means in the base section which connects the convex push button section, or carrying out plastic deformation, or some expanding. Namely, although explained in full detail also behind With the rod 27 of the Mt. Tsurugi-like fixture 26 shown in drawing 3 (e), perform physical plastic deformation processing to the necessary part of the resin film 2 by press thru/or \*\*\*\*, etc., or For example, (plastic deformation section 12 reference of drawing 3 (f)), The resin film 2 can incurvate now X and Y both directions free by irradiating laser light with the laser light irradiation device 29 shown in drawing 4 at the necessary part of the resin film 2, performing physical thinning processing, and forming the thinning section 13 etc.

[0009] It is thought that it is not that the phenomenon of plastic deformation and the phenomenon of thinning happen separately in this case, and both have generated the base section of the keytop plate made from a resin film in coincidence although a free curve and the effectiveness you make it ineffective to it being turnable are attained by performing physical plastic deformation processing and physical thinning processing. Of course, if a free curve and crookedness may be attained plastic deformation by the processing method to choose, a free curve and crookedness can be attained mainly by thinning. It pushes (the case of tip heating is also included), in physical processing of electron beam irradiation, plasma treatment, etc., what has the large place which is depended on the Mt. Tsurugi-like fixture mentioned later, and which is undertaken to plastic deformation is seemed, and, in a laser light

exposure, the place undertaken to thinning is presumed to be a large thing. However, even if it is cases, such as forcing by the Mt. Tsurugi-like fixture, thinning is produced and the plastic deformation by the heat release accompanying a laser light exposure may also be considered. From this semantics, by this invention, physical plastic deformation processing and physical thinning processing are put in block, and it is only called plastic deformation processing below.

[0010] Hereafter, based on a drawing, the gestalt of operation of this invention is explained to a detail about the example of a cellular phone. Drawing 1 shows easily the one hand free type cellular phone in which alter operation is possible only by hand incorporating the keytop plate made from a resin film of this invention of one of the two based on human engineering. As for drawing 1 (a), drawing 1 (b) shows the time of this closing at the time of protection [ a microphone-cum-] covering 15 release. Here, as for the convex push button section and 9, 3 is [ covering and 11 ] printing layers. Drawing 2 is drawing explaining the detail of the keytop plate structure of this invention, drawing 2 (a) - (d) is a sectional view which meets A- [ in drawing 1 (a) ], B-, C-, and D-each line, respectively, and the top view of the keytop plate 1 with which drawing 2 (e) is used by drawing 1 , and drawing 2 (f) are the perspective views of only the keytop plate 1 built into equipment.

[0011] The keytop plate 1 consists of the resin film 2, the convex push button section 3, the base section 4, the keytop section 5, and the press section 6, and the press section 6 is located corresponding to the contact surface 8 on the electrode substrate 7. 10 is a covering bottom plate. Drawing 3 is drawing explaining each process which shows an example of the manufacture approach of the keytop plate 1 of this invention. Drawing 3 (a) The process which carries out pre foaming of the resin film for the resin film 2 using the metal mold or the fixture of the male 21 for preforms and a female 22 beforehand is shown. Drawing 3 (b) The resin film 2 by which the preform was carried out is shown. Drawing 3 (c) The process filled up with resin through the resin installation path 25 using a mold (a male 23, female 24) is shown. the resin film 2 by which the preform was carried out -- other resin restoration -- public funds -- drawing 3 (d) The shaping resin film 2 with which it filled up with resin is shown. Drawing 3 (e) The process which uses the Mt. Tsurugi-like fixture 26 for the shaping resin film 2 with which it filled up with resin, and performs plastic deformation processing to the necessary section of the resin film 2 is shown, and drawing 3 (f) shows the resin film 2 after shaping with which plastic deformation processing was performed to the necessary section. 12 is the plastic deformation section.

[0012] Drawing 4 is drawing explaining the process which shows other gestalten of the manufacture approach of the keytop plate of this invention, it irradiates laser light with the laser light irradiation device 29, performs plastic deformation processing to the necessary section of the base section 4 of the resin film 2, and forms the thinning section 13. The casing configuration of the cellular phone shown in drawing 1 is giving the curvature which made the near configuration where the thumb of casing contacted approximate to the curve of the lifeline as used in the field of lines-on-the-palms study, in order to ensure a grip. in addition, the time of alter operation -- the thumb -- a numerical keypad ("0" - "9" and "\*" --) The horizontal array of a key that three trains of the key of 12 of "\*" should be easily made operational "1" train (train of "A-line"), A casing configuration and key height make it have changed so that the location of a key top panel may become high one by one at the order of "2" trains (train of "B-line"), and "3" trains (train of "C-line") and it may become the again same height as "1" train in the "\*" train of the 4th train.

[0013] Moreover, it is made to have changed also about the vertical array of each train, so that each train may draw radii, respectively. For example, although "1" train consists of a key in which each sign of "1", "4", "7", and "\*" was formed, it applies to the key of a sign "4" from the key of a sign "1", and the height of a key top panel becomes high and is low gently-sloping to the key of a sign "7", and the key of a sign "\*" with a peak of the key of a sign "4." The key is arranged so that "2" trains and "3" trains may also present the shape of predetermined radii, respectively. By taking such key arrangement, the input of a numerical keypad is easily attained with the thumb, certainly gripping the body of equipment. In addition, the key of "\*" has prepared the key of the "\*" train of the 4th train in the input in the middle finger, and the location where it becomes easy [ the input in the third finger, and a "clearance" key ] to input the "\*" key in a digitus minimus.

[0014] The protection [ a microphone-cum-] covering 15 which has a microphone has hinge structure, and the duty of protection covering of a liquid crystal display 14 is achieved at the time of carrying. However, it is not covered to the part which displays time of day, the receipt information from the others, etc. In addition, since the suitable include angle for about 90 - 120 degrees opens protection covering to the body by pushing a release button (not shown) on the occasion of the message, a message person's voice can be gathered certainly. Moreover, since a liquid crystal display 14 has a body caudad, there is also an advantage which can check the display of duration of a call, a tariff, etc. easily during a message.

[0015] Free, it must be able to curve and the resin film 2 of the keytop plate 1 built into such equipment must be able to be crooked, as shown in drawing 2 (a) - (f). Drawing 2 (a) A-, B-, C-, and D-each line is met a passage clear also from - (f). The resin film 2 A depression is between nothing, "1" train (train of "A-line"), "2" trains (train of "B-line"), and "3" trains (train of "C-line") about the smooth curve of the crown (refer to drawing 2 (d)), and "3" trains differ in the inclination of the smooth curve of the crown from the "\*\*\*\*" train of the 4th train. in order to make such a complicated curved surface form in the resin film 2 -- the both directions of X-Y -- free -- curve - it must be turnable.

[0016] Therefore, in this invention, plastic deformation processing is minutely performed to the necessary sections other than convex push button section 3 of the resin film 2. By performing plastic deformation processing minutely, a curve, bending, etc. of the part of the resin film 2 to which plastic deformation processing was performed minutely which were approximated to the rubber-like elasticity object become possible. As an ingredient of the resin film 2 which constitutes the keytop plate 1 of this invention, although there is especially no limitation, from various resin films, such as a commercial PET (polyethylene terephthalate) film, a PBT (polybutylene terephthalate) film, and a PEN (polyethylenenaphthalate) film, that it can print, the resin film in which spinning is possible is chosen suitably, and it should just use it. Moreover, an alloy resin film may be used in consideration of an adhesive property with the resin with which it is filled up in the keytop section 5 3, i.e., the convex push button section, and unification nature. For example, restoration resin and a resin film can really be fabricated, without using adhesives exceptionally, if PET / PC (polycarbonate) alloy film is used for a resin film in using a polycarbonate as resin with which it is filled up.

[0017] The thickness of the resin film 2 should just choose the thing of the thickness in which spinning is possible, although the 50-200-micrometer thing is generally marketed. Since a sign to show the role of alter operation and a pattern are generally needed for the convex push button section 3 of the keytop plate 1, a sign and a pattern may be beforehand formed on the resin film 2 by printing etc., and you may prepare in a keytop top panel or rear-face side after spinning. Although the resin pressure of restoration resin itself may perform spinning of the convex push button section 3 of the resin film 2 in the case of this shaping, in order to form a keytop configuration in accuracy more, it is desirable to carry out pre foaming of the resin film 2 using another metal mold or an another fixture beforehand.

[0018] Although the convex push button section 3 can form a resin film by carrying out spinning, since feeling of hard finger touch sufficient by just it is not obtained or it is also considered that a feeling of finger touch gets worse with prolonged use, What do not stop because spinning of the resin film is only carried out, but it is filled up with fluid resin or fluid rubber in the space inside this convex push button section 3, it is made to harden or solidify, and is considered as the keytop section 5 is desirable. The feeling of hard finger touch which was excellent as restoration resin in this case when high degree-of-hardness resin, such as a polycarbonate, polyester, and an acrylic, was used is obtained. Moreover, there are rubber, such as polyurethane rubber or silicone rubber, and an advantage of being hard coming to sense fatigue by the finger even if it performs long duration press actuation in choosing various thermoplastic elastomer as a filler. In addition, let it be arbitration to perform priming or adhesives processing to a resin film beforehand in consideration of the adhesive property of the resin film 2 and restoration resin.

[0019] Although it can be set as arbitration by the thickness of the resin film itself, the design of a final product, etc., the fill into convex push button section 3 space, such as restoration resin, should just make a standard about 70% of convex push button section 3 height, when lightweight-ization of a final

product is thought as important. The press section 6 which presses the contact surface 8 of the electrode substrate 7 is formed in the lower part of the keytop section 5. Since a curve, crookedness, etc. carry out the resin film 2 when the keytop plate 1 is incorporated, the die length of the press section 6 is adjusted by the die length doubled with it. Generally, although it is a difficult reason on the property of an ingredient to incurvate XY both directions to coincidence like rubber, before an assembly, the resin film 2 is performing plastic deformation processing only to the base section minutely in advance, and becomes the curve approximated to the rubber-like elasticity object, and bendable.

[0020] It is good to carry out plastic deformation processing of \*\*\*\*(ing), or irradiating laser light with the laser light irradiation device 29 which pushes, and is made to produce the plastic deformation elongation of a dent or the very small range, or is shown in drawing 4, and forming a very small depression as the approach of plastic deformation processing, with the rod 27 of the Mt. Tsurugi-like fixture 26 as shown in drawing 3 (e), etc. with physical means. What is necessary is for blasting processing, electron-beam-irradiation processing, plasma treatment, etc. to occur, and just to choose the technique of arbitration as the approach of other plastic deformation processings. Since the suitable reinforcement of the conditions of plastic deformation processing differs respectively with the thickness of a resin film, the quality of the material, etc., it is good for beforehand to investigate optimum conditions. In addition, it may not stop to perform only \*\*\*\* and forcing, but where a rod 27 is pushed against a resin film, very small vibration may be added to the right-and-left upper and lower sides to ensure plastic deformation processing using this Mt. Tsurugi-like fixture 26.

[0021] Timing which performs plastic deformation processing of the resin film 2 may be performed after a mold diaphragm of a resin film, and before a resin film carries out the mold diaphragm of sheet-like voice, i.e., the resin film, ( drawing 3 (a) - (f)), it may be beforehand performed to a base section equivalent part. The Mt. Tsurugi-like fixture 26 can also be used in ordinary temperature, and it can heat and it can also be used. When performing plastic deformation processing using an ordinary temperature Mt. Tsurugi-like fixture 26 like drawing 3 (e), it is good to cover the inferior surface of tongue of a resin film with the elastic mat 28. The cushioning properties [ without tearing the resin film 2 by \*\*\*\* by the ordinary temperature Mt. Tsurugi-like fixture 26, and forcing ] which can generate a detailed wrinkle innumerable although especially limitation does not have the quality of the material of this elastic mat 28, From the place which also needs a certain amount of rigidity, preferably If the elastic modulus slightly higher than the elastic modulus of this resin film and the layer which specifically has an elastic modulus higher 3 to 10% than the elastic modulus of this resin film are prepared 20 or more-time thick Mino of this resin film at least Plastic deformation processing can fully be performed in pressurization about 20kg/cm<sup>2</sup> or less in the short-time pressurization for about 5 - 20 seconds, and about five - ten repeat actuation, and it is desirable. Use of an elastic mat can be suitably selected by adjusting the pressure of a rod 27, and forcing time amount.

[0022] Urethane resin, thermoplastic elastomer, etc. are mentioned as the quality of the material of many rods 27 of the ordinary temperature Mt. Tsurugi-like fixture 26. Incidentally the proper degree of hardness of a rod 27 is good to consider as 30 - 50 Shore D degrees of hardness. In addition, since a protection-against-dust waterproofing function falls when the resin film has been made to penetrate with a rod 27, it is desirable [ the tip of a rod ] not to consider as a sharp configuration but to consider as the configuration which wore spherical \*\*\*\*\* so that such a thing may not happen. moreover -- although the path size of a rod is based also on resin film thickness and a resin film degree of hardness -- 10 or more times of the thickness of the resin film 2 -- desirable -- 30 to 100 times -- then, it is good.

[0023] Moreover, plastic deformation processing may be performed using the heating Mt. Tsurugi-like fixture 26. In this case, although a rod 27 can also be considered as metal, since a through tube may arise on a resin film by forcing, the thing without an edge for which it supposes that it is spherical and heat-resistant elastic layers with the thin thickness of about 0.5 moremm (for example, fluororubbers, such as a Viton (Du Pont-Toray trade name) etc.) are formed is desirable [ rod 27 tip ]. the diameter of a rod -- 100 times to 150 times of the thickness of the resin film 2 -- then -- good -- further -- the temperature at the tip of a rod -- the near glass transition point of this resin film -- it is the temperature below softening temperature preferably above a glass transition point, and it is good to push for 3 to 20 seconds by the



0.1-10kg/cm<sup>2</sup> load. In addition, in the plastic deformation processing by this heating method, very small vibration of the right-and-left upper and lower sides is not necessarily needed.

[0024] The count of repeat actuation makes it arbitration 5 - 10 times, then to shorten the forcing holding time of each time as it is good and the count of forcing laps. In addition, what is necessary is just to use thermally conductive elastic bodies (for example, rubber-like elasticity object which comes to blend boron nitride and an aluminium powder with silicone rubber) in consideration of thermal efficiency, although it is the elastic mat 28 in the case of using the heating Mt. Tsurugi-like fixture 26. The plastic deformation processing using ordinary temperature or the heating Mt. Tsurugi-like fixture 26 is simple for the structure of equipment and a fixture, and although the keytop plate finally obtained is a product made from a resin film, it has the merit that curve, bend a base part and it is just made free like the keypad made of rubber. When performing plastic deformation processing to the base section 4 of the resin film 2 using the Mt. Tsurugi-like fixture 26, it is very easy to adjust extent of the plastic deformation, or to adjust the rod consistency of a Mt. Tsurugi-like fixture, and to adjust a flexible degree suitably, and the location to give can also be chosen as arbitration. Furthermore, it is also possible to change extent of plastic deformation by the location.

[0025] In addition, it is [ of a keytop plate ] good to limit to some parts very much and perform plastic deformation processing for the laser light irradiation device 29 to perform plastic deformation processing. In this case, as a laser model to be used, carbon dioxide laser or an YAG laser is mentioned. Any of a mask method and a scanning method are sufficient as the approach of laser radiation. It is good to carve and to draw x pattern continuously over the predetermined range by continuation of x pattern of 1mm angle in performing plastic deformation processing to the thing of 100-150-micrometer thickness of the PET film by laser light exposure which is a typical resin film although lump width of face and the depth change with the quality of the material of a resin film, thickness, etc., as carved with the line breadth of 0.5-2 micrometers and shown in drawing 4 as a lump depth of 20-50 micrometers - 3mm angle. In addition, it is good to give x pattern from both sides of the resin film 2 preferably especially. In this case, when the depth in the direction of the inside of bending is made shallower than the depth in the direction of outside, bending becomes easy and is especially desirable.

[0026] Generally the keytop plate 1 is arranged on the electrode substrate 7. When all the press sections are made into the same die length like the conventional keytop plate, it becomes impossible not to produce a problem, even if it makes the die length of two or more press sections 6 by which bulge formation is carried out the same die length on each keytop inferior surface of tongue since the electrode substrate 7 is usually a flat surface, but to contact uniformly for the electrode substrate 7, in order that the keytop plate 1 of this invention may curve the film base 4 free. Therefore, irregularity is suitably prepared in electrode substrate 7 the very thing, or electrode substrate 7 the very thing is good also as making the die length of the press section 6 correspond suitably using a flat thing.

[0027]

[Example] (Example 1) The keytop plate made from a resin film which fits the cellular phone shown in drawing 1 by the following approaches was manufactured. As a resin film, the polycarbonate was beforehand prepared for the PET film of 125-micrometer marketing as resin for convex push button section restoration. Signs, such as "1" - "9" and "0" and "\*", "#", "ABC", and "DEF", were first printed in polyester system ink in the predetermined location of a resin film. next, this resin film -- spinning -- public funds -- it inserted to the mold, and after carrying out spinning of the resin film with the resin pressure in this case and really fabricating polycarbonate resin and a PET film by pressing polycarbonate resin fit into the mold cavity for convex push button section formation of metal mold, the keytop plate obtained from metal mold was taken out. Since a curve was not able to do so that an arc may only be greatly drawn once on either the direction of X of a product, or the direction of Y, since it is what is formed using the resin film, this keytop plate was not able to be used for the pocket device application of a complicated configuration as shown in drawing 1.

[0028] Then, two or more rods with a spherical tip which consist of an SUS ingredient (the fluorine system rubber layer of 0.7mm thickness is prepared at 125 rods and a tip.) The degree of hardness of this fluorine system rubber layer heats beforehand the rod of the heating Mt. Tsurugi-like fixture which has

80 Shore A degrees of hardness at 120 degrees C (the softening temperature of PET is 260 degrees and a glass transition point is 75 degrees), pushed it for 5 seconds by the 1kg/cm<sup>2</sup> load, once opened the load wide, it was made to move to the whole all around about 0.5mm, and plastic deformation processing by pushing 6 times was performed. Thus, even if the keytop plate which performed plastic deformation processing consisted of resin films (PET film), its manufacture of the keytop plate for the equipments of a complicated configuration as suitably turned into a desired configuration a curve and bendable and shown in drawing 2 was possible for the base section.

[0029] (An example 2, example of a comparison) The keytop plate made from the resin film of the cellular-phone application of an appearance as shown in drawing 6 was produced as an example of a comparison based on the indication of the first example indicated by JP,7-302526,A that the lightweight-ized effectiveness by keytop plate adoption of this invention should be checked. That is, without the film base itself incurvating the direction of a short hand to the keytop top panel being made to carry out the sequential curve array of PEN and the restoration resin by incurvating the film base itself and including in a cellular phone at the polycarbonate and the longitudinal direction, as for a resin film, by changing the height from the film base to a keytop top panel one by one, it manufactured so that the sequential curve array of the keytop top panel might be carried out.

[0030] On the other hand, the same thing as the resin film and restoration resin which were used for the above-mentioned example of a comparison is used. And although the configuration of the keytop exposed from casing of the appearance of a cellular phone etc. is the same, it is carrying out plastic deformation processing of the base section of a resin film. The keytop plate which made reducible the fill of the polycarbonate to convex push button circles was obtained by the following approaches by enabling the curve of the resin film itself free in XY (product short hand-straight side) both directions, and changing the die length of the press section with a location. That is, in the resin film, plastic deformation processing was performed using the ordinary temperature Mt. Tsurugi-like fixture (for urethane resin and the diameter of a rod, 1mm and a rod number are [ the rod quality of the material ] 198) so that a rod might contact base films other than the keytop formation schedule section. After sandwiching the resin film between this fixture and the elastic mat (product made of silicone rubber of 75 Shore A degrees of hardness) and specifically applying about 20kg/cm<sup>2</sup> load for 8 seconds, the load was canceled, the location was slightly shifted from the location, and actuation of pressurization was again repeated 20 times on these conditions.

[0031] thus, the resin film which performed obtained plastic deformation processing -- first -- a temporary diaphragm -- public funds -- the this resin film after a mold performs a film temporary diaphragm -- another resin restoration -- public funds -- it inserted to the predetermined location of a mold, and polycarbonate resin was filled up with the air dispenser into the temporary diaphragm opening section (background of the convex push button section), and it took out from the back metal mold which carried out heating pressurization. Thus, since plastic deformation processing is fully made, in XY both directions, free, it curves and the obtained keytop plate can bend the film base. When the weight of the case corresponding to the weight and each keytop plate of the keytop plate obtained by the conventional technique and the keytop plate obtained by this invention was finally measured, it was as in Table 1.

[0032]

[Table 1]

【表1】実施例2と比較例との重量比較

比較例		実施例2	
キートップ板	ケース	キートップ板	ケース
100	100	96	97

(比較例の重量を100とした相対値)

[0033] It is using the keytop plate of this invention, and this result showed at least that lightweight-ization was attained about 4% in the sum total weight of a keytop plate and corresponding casing, even if the exterior of a final product was the same.

[0034] (Example 3) In accordance with each specification of \*\* - \*\*, the range of a plastic deformation art and plastic deformation processing was changed, and the keytop plate was manufactured in order to build the same keytop plate into the case of a configuration where plurality differs and to use it as a common member of two or more products.

\*\* about [ of a type \*\* keytop plate with the complicated curve of the configuration of a case ] -- although the property which curves free about one third of the film bases is required -- about [ remaining ] -- the point of the type \*\* marking line by which the rigidity of a film is demanded due to a protection-against-dust waterproofing property about two thirds of the film bases -- very -- precision -- the type [0035] with which it is required that it should bend about a predetermined part highly and a bend should be formed In manufacturing above \*\* - \*\*, each resin film chose the PET film and used silicone rubber (a rubber degree of hardness is 50 degrees at the Shore A degree of hardness) as fluid rubber for restoration. The concrete film diaphragm and the resin restoration approach presupposed that it is the same as that of an example 2. however, the voice which a plastic deformation art tends to acquire as follows -- we decided to change more suitably like. \*\* The plastic deformation processing in a type carried out the whole base section of a product to homogeneity with the ordinary temperature Mt. Tsurugi-like fixture. The concrete plastic deformation art presupposed that it is the same as an example 2. \*\* Although the Mt. Tsurugi-like fixture also performed plastic deformation processing in a type to this appearance, area which is about 2 of the base section/3 was not processed.

[0036] \*\* The successive line according to xx by laser radiation like the part equivalent to the part which made the resin film inside-out further after carrying out laser radiation so that xx may form a line in the predetermined range from one field of a resin film continuously like drawing 4 , using an YAG laser about a type, and formed the successive line of xx previously was formed (it carves and, for both sides, the lump depth is 30 micrometers). As mentioned above, even if it was the intermediate product which carried out spinning of the same resin film, it became clear that there was a merit that common use can be carried out as a keytop plate for the switching equipment of two or more patterns with which design nature differs from the engine performance, by changing the approach of plastic deformation processing and conditions.

[0037]

[Effect of the Invention] While the keytop plate by this invention has the feeling of hard finger touch of a resin film proper, since the free curve near the keypad made of rubber is possible, depending on about [ that it can respond to diversification of the design of switching equipment ], and a design, lightweight-ization of portable equipments, such as a cellular phone, of it is also attained. Moreover, by changing plastic deformation processing conditions, even if the class of equipment final product was various, it used in common and it also turned out that it is usable.

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** The perspective view of the cellular phone incorporating the keytop plate of this invention. At the time of a protection [ the [ drawing 1 (a)] microphone-cum-] covering release

At the time of protection [ the [ drawing 1 (b)] microphone-cum-] covering closing

**[Drawing 2]** The detail explanatory view of the keytop plate structure of this invention

The sectional view which meets "A-line" among [ drawing 2 (a)] drawing 1 (a)

The sectional view which meets "B-line" among [ drawing 2 (b)] drawing 1 (a)

The sectional view which meets "C-line" among [ drawing 2 (c)] drawing 1 (a)

The sectional view which meets "D-line" among [ drawing 2 (d)] drawing 1 (a)

The top view of the [ drawing 2 (e)] keytop plate

The perspective view of only the keytop plate built into [ drawing 2 (f)] equipment

**[Drawing 3]** The explanatory view of each process showing an example of the manufacture approach of the keytop plate of this invention

The explanatory view showing the process which carries out pre foaming of the [ drawing 3 (a)] resin film

Drawing showing the resin film by which the [ drawing 3 (b)] preform was carried out

The explanatory view showing the process filled up with resin on the resin film by which the [ drawing 3 (c)] preform was carried out

Drawing showing the shaping resin film with which it filled up with [ drawing 3 (d)] resin

The explanatory view showing the process which uses a Mt. Tsurugi-like fixture for the necessary section of the shaping resin film with which it filled up with [ drawing 3 (e)] resin, and performs plastic deformation

Drawing showing the resin film with which plastic deformation was performed to the [ drawing 3 (f)] necessary section

**[Drawing 4]** The explanatory view of a process showing other gestalten of the manufacture approach of the keytop plate of this invention

**[Drawing 5]** The perspective view of the keypad made of rubber in the conventional technique

**[Drawing 6]** The sectional view in every direction and keytop plate top view which made it curve in the direction of Y like [ at the time of inclusion of the keytop plate in the conventional technique (JP,7-302526,A) ]

[ Drawing 6 (a)] top view

Drawing of longitudinal section which meets the F-F line in [ drawing 6 (b)] drawing 6 (a)

The cross-sectional view which meets the E-E line in [ drawing 6 (c)] drawing 6 (a)

**[Description of Notations]**

1: Keytop plate

2: Resin film

3: Convex push button section

4: Base section (film base)

5: Keytop section  
6: Press section  
7: Electrode substrate  
8: Contact surface  
9: Covering  
10: Covering bottom plate  
11: Printing layer  
12: Plastic deformation section  
13: Thinning section  
14: Liquid crystal display  
15: Protection [ a microphone-cum-] covering  
16: The hole for attachment  
21: Male metal mold for preforms  
22: Metz metal mold for preforms  
23: Male metal mold for resin restoration  
24: Metz metal mold for resin restoration  
25: Resin installation path  
26: Mt. Tsurugi-like fixture  
27: Rod  
28: Elastic mat  
29: Laser light irradiation device  
a: Keypad  
a': Keytop plate  
b: Sheet-like rubber base section  
b': Resin film  
c: Convex push button section  
d: Base section (film base)  
e: Keytop section  
f: Press section

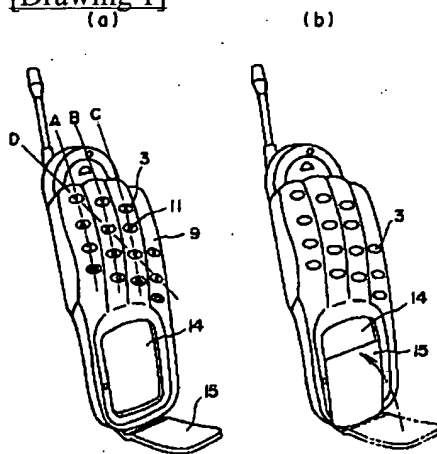
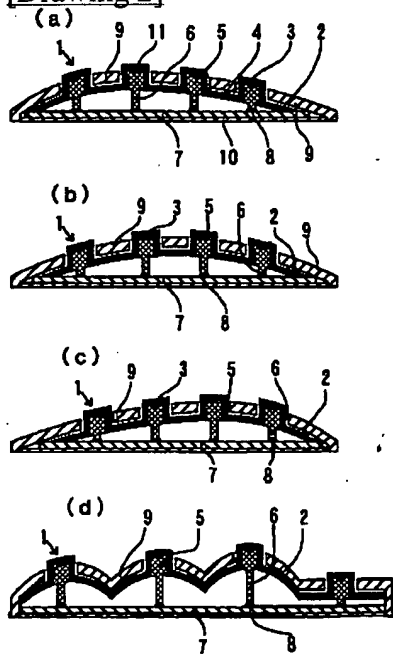
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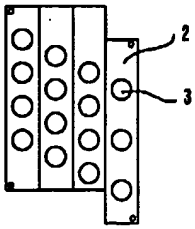
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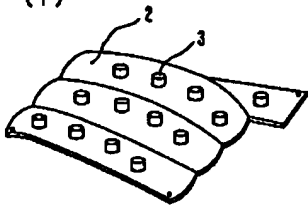
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**DRAWINGS****[Drawing 1]****[Drawing 2]**

(e)

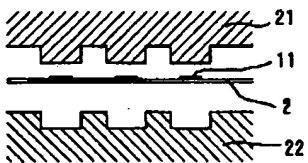


(f)



[Drawing 3]

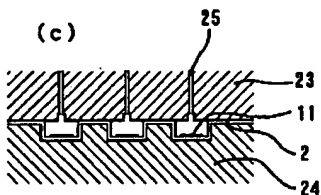
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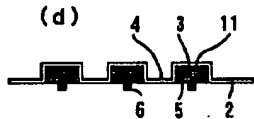
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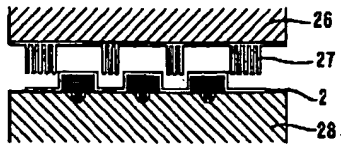
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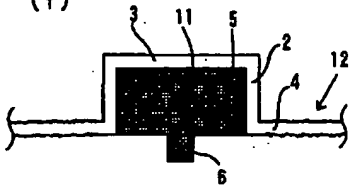
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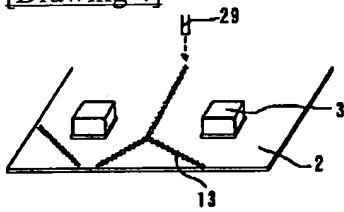
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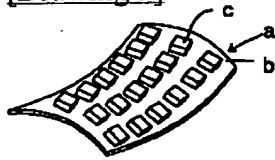
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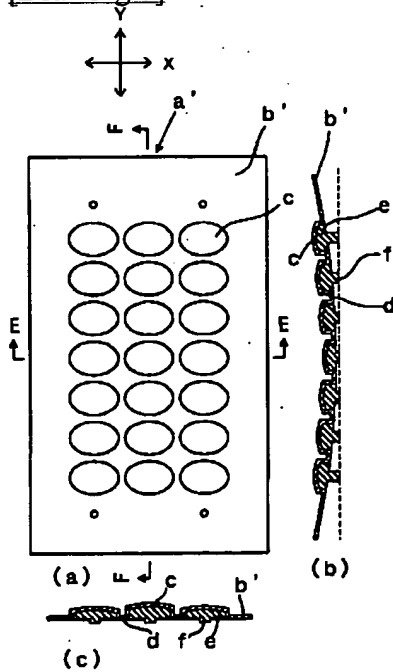
[Drawing 4]



[Drawing 5]



[Drawing 6]





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[Translation done.]